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Modeling and Measurements of Multiscalar Subgrid-Scale Mixing for LES/FMDF[1] ABHILASH CHANDY, STEVEN FRANKEL, Purdue University, MATT DINGER, JIAN CAI, CHENNING TONG, Clemson University, CAMPBELL CARTER, WPAFB — One of the main challenges in applying the filtered mass density function (FMDF) approach in the context of large eddy simulation (LES) of turbulent reacting flows is related to the ability of the mixing model to accurately predict subgrid-scale multiscalar mixing of passive or active scalars. LES/FMDF predictions and preliminary experimental measurements for three-stream mixing in a turbulent jet featuring a co-annular jet of ethylene and acetone-doped air issuing into an air co-flow, geometrically and hydrodynamically similar to recently studied piloted jet flames, will be presented. Laser-based diagnostics are used to obtain instantaneous and spatially filtered mass fraction measurements of relevance to the FMDF and its statistics. LES/FMDF studies, based on high-fidelity numerical methods, will compare predictions obtained from different mixing models and explore sensitivities to mixing model parameters with a focus on the mechanical-to-scalar time scale ratio.

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